CLAIMS

1. A method of transmitting symbols in a wireline multi-carrier communication system in which each symbol is modulated for transmission over a carrier group of pre-determined size, the method comprising the steps of:

identifying all available carrier groups; and

transmitting a replicate of the symbol on at least half of the available carrier groups.

2. A method according to claim 1 wherein the symbol is transmitted on all available carrier groups.

3. A method according to claim 1 additionally comprising the steps of:

applying a pre-determined phase-shift to the symbol transmitted on at least one of the available carrier groups, whereby to mitigate peaks in transmitted instantaneous signal power across all carriers.

3. A method according to claim 2 wherein all replicates are phase-shifted relative to each other.

4. A method according to claim 1 additionally comprising the step of:

for at least one available carrier group, phase-shifting a symbol portion transmitted on a carrier in the carrier group relative to a second carrier in the carrier group, whereby to mitigate peaks in transmitted signal power across all carrier groups.

5. A method according to claim 4, wherein all signal portions within a carrier group are phase-shifted relative to each other.

6. A method according to claim 4, wherein the step of phase-shifting is applied to all available carrier groups.

7. A method of transmitting initialisation messages in a wireline multi-carrier communication system, the method comprising the steps of:

partitioning an initialisation message into one or more symbols;

modulating one of the symbols for transmission over a carrier group of known size;

identifying all available carrier groups; and

transmitting a replicate of said one of the symbols on each available carrier group.

8. A method according to claim 7, wherein the initialisation messages are DSL messages

9. A method according to claim 7 wherein the initialisation messages are selected from the group consisting of Very High Speed Digital Subscriber Line (VDSL), Asymmetric Digital Subscriber Line (ADSL), G.Lite and G.DMT messages.

10. A transmitter for a wireline multi-carrier communication system comprising:

a modulator for modulating symbols for transmission over a pre-determined number of carriers; and

a carrier allocater arranged to identify all available carrier groups having the pre-determined number of carriers;

a replicator arranged to output a replicate of each of the symbols on each of the available carrier groups.

11. A modem for a wireline multi-carrier communication system comprising a transmitter according to claim 10.

12. A wireline multi-carrier communication system comprising a transmitter according to claim 10.

13. A transmitter according to claim 10 wherein the symbols form connection initialisation messages.

14. A transmitter according to claim 13, wherein the initialisation messages are DSL messages.

15. A transmitter according to claim 14, wherein the initialisation messages are selected from the group consisting of VDSL, ADSL, G.Lite and G.DMT messages.

16. A transmitter according to claim 10 additionally comprising;

a phase shifter arranged to determine the transmission phase on the available carrier responsive to pre-determined carrier phase-shift data.

17. A multi-carrier transmission signal in a wireline multi-carrier communications system, the signal comprising:

simultaneous transmission of a modulated symbol over all available carrier groups.

18. A signal according to claim 17, wherein a first symbol portion on a carrier in one of the carrier groups is phase-offset relative to a second symbol portion on a second carrier in one of the available carrier groups, whereby to mitigate peaks in signal power.

19. A program for a computer on a machine readable medium for transmitting symbols in a wireline multi-carrier communication system in which each symbol is modulated for transmission over a carrier group of pre-determined size, the program being arranged to perform the steps of:

identifying all available carrier groups; and

transmitting a replicate of the symbol on at least half of the available carrier groups.

20. A program for a computer on a machine readable medium for transmitting initialisation messages in a wireline multi-carrier communication system, the program being arranged to perform the steps of:

partitioning an initialisation message into one or more symbols;

modulating one of the symbols for transmission over a carrier group of known size;

identifying all available carrier groups; and

transmitting a replicate of said one of the symbols on each available carrier group.

21. A method of establishing a connection between a transmitter and a receiver in a wireline communication system, the method comprising the steps of:

at the transmitter, partitioning a connection initialisation message into one or more symbols, modulating each symbol for transmission over a carrier group of predetermined size, identifying all available carrier groups, and transmitting a replicate of each symbol on at least half the carrier groups; and at the receiver, receiving said replicates of each symbol, reconstructing the initialisation message from said received replicate symbols, and opening the connection in response to the initialisation message.

22. A method of receiving symbols in a wireline multi-carrier communication system in which each symbol is modulated for transmission over a carrier group of pre-determined size, the method comprising the steps of:

receiving signals on a plurality of carrier groups;

selecting one or more of the plurality of carrier groups responsive to a measure of respective signal quality;

recovering a symbol from signals received on the at least one of the plurality of carrier groups.

23. A method according to claim 22 in which the step of recovering comprises the step of:

summing the signals received on the at least one of the plurality of carrier groups.

24. A receiver for a wireline multi-carrier communication system comprising:

a carrier receiver arranged to receive signals on a plurality of carrier groups;

a carrier group selector arranged to select at least one of the plurality of carrier groups, responsive to a measure of respective signal quality;

a symbol recovery unit arranged to recover symbols from the at least one of the plurality of carrier groups.